

September 29, 1999

## End-Summer Project Activity Report

Chien-Lu Ping

In the following report, we present the soil morphological properties and environmental parameters of ATLAS sites in Kuparuk River Basin, Oumalik, Ivotuk and Council. We did not sample the soils in Quartz Creek due to logistic limitation and we will wait till summer, 2000.

The morphological properties include soil horizon, depth, color (Munsell), field texture, structure, consistence, gravel content, root distribution, active layer depth based on cryogenic structure, and soil boundary. After soil profile study and sampling, we filled up the pit and put the organic mat back. The site should be recovered after a year (you won't be able to find it again!).

Soil horizon designation:

O – organic horizon. Oi – peat, least decomposed, containing >75% fibers after rubbing.

Oe - mucky peat or peaty muck, intermediate stage of decomposition, containing 17-75%.

fiber after rubbing. Oa - most humified organic matter, containing <16% fiber after rubbing.

A - mineral horizon with in-situ accumulation of organic matter due to root residue.

B - weather horizon. Bw - mostly brownish indicating Fe oxides and some with mottles. Bg - gleyed or reduced horizon with gray or bluish gray color.

C - parent material, least weathered, substrates.

BC - transitional horizon between B and C.

R - bedrock.

Wfm - Ice wedges or ground ice.

Other subscripts - b: buried horizon. jj: cryoturbated horizon. f: frozen due to permafrost.

The soil samples are currently analyzed for physical and chemical properties in Palmer Research Center and the results will be released by early next year.

## June 1999

Field work was carried out as part of the UAF Summer Course NRM-495 Alaska Soil Geography Field Class sponsored by School of Agriculture & Land Resource Management, University of Alaska Fairbanks. The main objective of the course was to study the morphology and hydric soils properties of permafrost soils in arctic Alaska.

June 24, we tried to sample the moist acidic tundra soils near the snow fence plot of Josh Schimmel but the season frost was only thawed 5 to 10 cm, thus I decided for later days.

Thus we only sampled the **dry heath plot**.

Location: Lat. 68° 37' 17" N.; Long. 149°35' 56" W.

Elevation: 1 m.

Landform: Terrace

Microrelief: undulating

Slope: 1-3%

Drainage: well-drained

Parent material: Glacial outwash.

Vegetation: *Dryas integrifolia* and *Salix arctica*.

Sampled by: C.L. Ping, G.J. Michaelson, R. Pringle, J. Arndt, E. Levine, N. Laporte and S. Goetz.

Soil profile description:

| Depth Horizon | Description |
|---------------|-------------|
|---------------|-------------|

---

(cm)

|        |                   |  |
|--------|-------------------|--|
| 0-3    | A                 | 10YR3/2, 2/2 loam; weak medium granular structure; very fraible, non-plastic and nonsticky; few very fine and common fine and medium roots;<br><br>abrupt smooth boundary to   |
| 3-18   | 2Bw               | 7.5YR4/6 gravelly loam; weak medium granular structure; very fraible, slightly plastic and nonsticky; common very fine and fine and few medium roots; clear smooth boundary to |
| 18-30  | 2BC<br>structure; | 10YR3/2 very cobbly coarse loamy sand; weak medium granular very fraible, non plastic and nonsticky; common very fine and fine roots;<br><br>clear smooth boundary to          |
| 30-62  | 2C1               | 10YR2/2 very cobbly loamy sand; single grained; loose, nonplastic and nonsticky; few fine roots;   |
| 62-100 | 2C2               | 10YR3/2 very cobbly loamy sand; single grained; loose, nonplastic and nonsticky; no roots.   |

Soil classification: Sandy or sandy-skeletal, mixed, frigid Typic Eutrocryept

Explanation: Sandy or sandy-skeletal, mixed, frigid family - this soil has a sandy or loamy sand texture and the gravel content exceeds 35 % but less than 60% by volume, mixed minerology, and the mean annual soil temperature at 50 cm is <8°C. Typic Eutrocryept - the common Inceptisols occur in this kind of parent materials with noticeable oxidation and base saturation >60% (to be verified in lab). This soil does not have permafrost within 1 m because of the coarse texture.

June 27, the class sampled the **West Dock** Kane & Hinzman's site (west of the West Dock access road)

Location: Lat. 70° 22' 21" N.; Long. 148° 33' 30" W.

Elevation: 1 m.

Landform: Coastal plain; sedge marsh (under 2.5 inches of water).

Microrelief: Plain

Slope: 0%

Drainage: Very poorly drained (ponded)

Parent material: Thaw lake deposit.

Vegetation: Carex sp.

Sampled by: C.L. Ping, R. Pringle, J. Arndt, R.J. Candler, and S. Goetz.

Soil profile description:

#### Depth Horizon Description

---

(cm)

0-20 Oi Sedge root mat, undecomposed

20-41 A Mucky silt loam

41-55 Cgf Frozen sediment, silty loam, gleyed presumably season frost

55-80 Cf Frozen sediment, upper permafrost, high ice content (>60% by volume)

Soil Classification: Coarse-silty, mixed, nonacidic, pergelic Histic Aquorthel

Explanation: Coarse-silty, mixed, nonacidic, pergelic family- the soil has a silty loam texture in its mineral horizons, mixed mineralogy, soil pH > 5.0, and having mean annual soil temperature at 50 cm -4 to -10° C. Histic- soils having >15 cm but <40 cm of organic horizon. Aquorthels - soils are wet with permafrost within 1 m to the surface and lacks cryoturbation.

**July 1999.** Soil sampling at the ATLAS sites in Ivotuk and Council. Investigators included C.L. Ping and , G.J. Michaelson (UAF), J.M. Kimble (NRCS national Soil Survey Center), L. Everett (Ohio State Univ.) and A. Munule (EPA). We took the Tatontuk charter flight from Fairbanks to

Ivotuk on July 6 and sampled soils associated with the 4 vegetation plots in Ivotuk and two plots in Oumalik from July 7 to 10.

**July 7. Ivotuk Plot 2, Shrub site**

Location: Lat. 68° 28' 42" N.; Long. 155° 44' 15" W.

Elevation:

Landform: Toeslope

Microrelief: slightly undulating and concave.

Slope: 6-8% south due east

Drainage: poorly drained

Parent material: Residual sedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| <u>Depth</u> | <u>Horizon</u> | <u>Description</u>  |
|--------------|----------------|---|
| (cm)         |                |   |
| 0-           | Oi             | Peat; 5-10 cm thick   |
|              | Oe             | 5YR2.5/3 muck peat, occasional cobbles on surface; 2-10 cm thick  |
|              | Oa             | 7.5YR3/3 muck; 3-6 cm ice lense amid the organic horizon; 5-15 cm thick   |
|              | Bg             | 2.5Y4/2 loam; medium to coarse platy structure; plastic and slightly sticky; seasonally frozen; 10% angular rock fragment; 20-30 cm thick |
|              | Wfm/Bgf        | Loam; 70% ice; mineral soil reduced; pockets of cryoturbated organic matter; 25 cm thick  |
| 85+          | Wfm            | Ice wedge   |

Soil classification: Fine-loamy, mixed, acidic, pergelic Glacic Histoturbel

Explanation: The depth increment of each horizon was not given because of the warped and distorted soil horizons due to cryoturbation. However, the ranges of thickness of each horizon was given. The soil has a loam texture and mixed mineralogy in its mineral horizons, and has acidic reactions (pH<5.5) and mean annual soil temperature at 50 cm colder than -4°C (estimated). The undulating but continuous organic layers and the cryoturbated horizons key the soil into Histoturbel great group, and the presence of ice wedge or massive ground ice keys the soil into Glacic subgroup. However, I do not expect the ice wedges to be continuous under this whole plot. Thus, for area where there is no ice wedges, the soil is classified as Fine-loamy, mixed, pergelic Ruptic Histoturbels because of the uneven thickness of the organic horizons.

### July 7. Ivotuk Plot 3, Moist nonacidic tundra

Location: Lat. 68° 28' 47.6" N.; Long. 155° 44' 05" W.

Elevation:

Landform: Piedmont

Microrelief: Solifluction lobe.

Slope: 5% south due east

Drainage: well drained

Parent material: Residual metasedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-5   | Oi      | Peat; many very fine, fine and medium roots; abrupt smooth boundary to   |
| 5-39  | Oe      | 5YR2.5/2 peaty muck, partiall decomposed organic matter; many very fine, |

fine and medium roots; abrupt smooth boundary to

39-60 Bw 10YR3/3 gravelly loam (25% fractured sedimentary rock); weak, medium angular block structure; slightly plastic and slightly sticky; common very fine, fine, and few medium roots; at the top of this horizon there is a thin layer of flat rock fragments; abrupt smooth boundary to

60-80 Cf 10YR2/1 very gravelly loam (40% fractured sedimentary rock fragments); massive, compact, slightly plastic and slightly sticky; ice lenses 1 mm thick about 2 cm apart

Soil classification: Coarse-loamy, mixed, nonacidic, pergelic Typic Molliturbel

Explanation: The color of the A horizon suggests a mollic epipedon and the soil horizons show evidence of down slope movement due to solifluction. Thus it is classified as Molliturbel. The sample was taken from the upper slope of the plot. The lower slope of the plot has a different microrelief; it is dominated by frostbroils and it is common to have fragment of shale or slate frost-churned to the surface.

#### **July 8 Ivotuk Plot 4 Moist acidic tundra**

Location: Lat. 68° 28' 49" N.; Long. 155° 44' 44.6" W.

Elevation:

Landform: Piedmont

Microrelief: Tussocks.

Slope: 0-1%

Drainage: poorly drained

Parent material: Residual sedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon  | Description  |
|-------|----------|--|
| (cm)  |          |  |
| 0-10  | Oi       | 5YR3/2 peat; many very fine, fine and few medium roots; abrupt clear boundary to   |
| 10-30 | Oe       | 7.5YR2.5/2 peaty muck; many very fine, fine and few medium roots; abrupt wavy boundary to  |
| 30-50 | Bg       | 10YR3/3 loam; fine lenticular structure 3-5 mm thick; seasonal frozen, ice lenses 1-2 mm and vertical ice veins 2-3 mm thick; slightly plastic and slightly sticky; 10% cryoturbated organic matter; clear wavy boundary to                          |
| 50-68 | Bg/Oajjf | Bg 2.5Y3/3 gravelly loam; 20% rock fragment with some rounded gravel; muck; 3-6 cm ice lense amid the organic horizon; 5-15 cm thick; plastic and slightly sticky; 30% cryoturbated organic matter; 10YR2/1 muck segregated ice crystals in organics |
| 68+   | Cf       | Upper Permafrost   |

Soil classification: Loamy, mixed, acidic, pergelic Ruptic Histic Aquiturbel

Expalnation: Ruptic Histic subgroup implies a organic horizon not even in thickness. Aquiturbel means a cryoturbated permafrost soils subjected to prolonged wetness and reduction during the growing season.



## July 8 Ivotuk Plot 1 Moist acidic tundra

Location: Lat. 68° 29' 12" N.; Long. 155° 44' 25" W.

Elevation:

Landform: Piedmont toeslope

Microrelief: Tussocks with frostboils

Slope: 6% SE convex

Drainage: poorly drained

Parent material: Residual sedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-22  | Oi      | 5YR3/3 peat, tussock roots and moss layer; many fine and common medium roots; 5-35 cm thick; abrupt wavy boundary to   |
| 22-41 | Oejj    | 7.5YR3/2 peaty muck, partially decomposed organic matter; many very fine, fine and few medium roots; common very fine, fine and few medium roots; 0-25 cm thick; abrupt wavy boundary to                   |
| 41-50 | Bwjj    | 10YR4/4 (50%) matrix, 2.5Y5/2(30%), 2.5Y5/0 (10%) and 7.5YR4/6 in root linings; silty clay loam; massive (wet), sticky and plastic; few very fine and fine roots; 0-20 cm thick; clear gradual boundary to |
| 50-63 | Bgjj    | 10YR4/1 (60%) matrix, 10YR4/4 (35%), 2.5Y5/1, 5/0 and 7.5YR4/4 Fe  |

depletions and concentrations around common fine root channels and

linings; fine sandy loam, 7% round gravel; massive, wet, slightly plastic and

slightly sticky; 5-20 cm thick; clear smooth boundary to

63-100 Bg/Oajjf 75% Bg 10YR4/1 and 2.5Y5/1 fine sandy loam, 25% Oa 10YR3/1 muck;

massive, upper permafrost; slightly plastic and slightly sticky; no roots.

Soil classification: Coarse-loamy, mixed, gelic Ruptic-Histic Aquiturbel.

Explanation: Soil organic horizon discontinuous due to tussock tundra therefore it's classified in the Ruptic-Histic subgroup. The soils has redoxmorphic features (mottles) in the Bwjj and Bgjj horizons thus it keys into the Aquic great group. The soil key into the Turbic suborder because the soil horizons are warped and discontinuous due to cryoturbation. The ending "el" means it's in the Gelisol order. The upper permafrost appear at 63 cm based on soil morphology.

July 10, 1999. **Oumalik 1. Acidic tundra**

Location: Lat. 68° 43' 58" N.; Long. 155° 51' 49" W.

Elevation:

Landform: Piedmont toeslope

Microrelief: Tussocks

Slope: 3% SW convex

Drainage: poorly drained

Parent material: Residual sedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-8   | Oi      | 10YR4/3 peat; moss and Eriophrum roots; clear irregular boundary to  |
| 8-15  | Oe/Oa   | 10YR2/1 mucky peat and 7.5YR2/0 muck; partially decomposed organic matter intermixed with muck; many very fine, fine and few medium roots; clear wavy boundary to  |
| 15-40 | Bg      | 5Y4/2 (60%) and 2.5Y4/3 (25%) silty loam; 7.5YR4/6 and 10YR5/3 around root linings; strongly reduced; massive, wet; slightly plastic and slightly sticky; common fine roots; lower part of this horizon seasonally frozen and with some woody fragment; clear wavy boundary to |
| 40-55 | Oejj/Bg | 10YR3/1 Oa; peaty muck; and 2.5Y4/2 silty loam; cryoturbated and reduced; seasonally frozen, massive, slightly plastic and slightly sticky; few fine roots and common medium root remains; abrupt smooth boundary to   |
| 55-75 | Wfm/Bgf | 2.5Y3/2 silty loam amid ice matrix; frost-churned Oe material mostly from partially decomposed Eriophrum roots; few fine and many fine root remains in Bg and Oe materials, respectively; ice content >60% by volume.  |

Soil classification: coarse-silty, mixed, gelic Ruptic-Histic Aquiturbel

Remarks: Ice lenses below the intertussocks Oi horizons ranged 3-5 cm thick. No frost boils observed.

July 10, 1999. **Oumalik 2. Moist nonacidic tundra**

Location: Lat. 68° 44' 05" N.; Long. 155° 52' 12" W.

Elevation:

Landform: Piedmont toeslope

Microrelief: Frostboils (inactive)

Slope: 3% SW convex

Drainage: poorly drained

Parent material: Residual sedimentary rocks

Sampled by: CL. Ping, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| <u>Depth</u> | <u>Horizon</u> | <u>Description</u>  |
|--------------|----------------|---|
| (cm)         |                |   |
| 0-5          | Oi             | Litter layer; abrupt wavy boundary to   |
| 5-27         | Bw             | 10YR3/3 (35%), 2.5Y3/2 (30%), 7.5YR4/6 (25%), and 10YR4/4 silty loam; weak, medium platy structure; friable when moist, slightly sticky and slightly plastic when wet; many very fine, fine, and few medium roots; clear smooth boundary to |
| 27-46        | Bg/Oajj        | 2.5Y3/2 (50%), 2.5Y4/2 (30%) silty loam and 10YR2/1 cryoturbated muck; weak medium platy structures; very friable when moist, slightly  |

sticky and slightly plastic when wet; common very fine and fine roots;

abrupt smooth boundary to

46-59 Bg 5Y2.5/1 (40%). 10YR3/1 (20%) silty loam and 10YR3/2 (15%) and

10YR2/1 (5%) muck in streaks; reduced; Fe concentrations in 7.5YR4/4

(20%) around root linings and in mucky streaks; weak medium platy

structures imbed with seasonally ice lenses; friable when moist and slightly

sticky and slightly plastic when wet; common very fine and fine roots;

abrupt smooth boundary to

59-67 Cf 5Y4/2 (60%), 5Y4/2 (25%) very fine sandy loam, and 10YR2/1 (15%)

muck; reduced; massive, frozen; slightly sticky and slightly plastic when

wet; ice net (vertical cracks) 2-3 cm apart and ice lenses 1-2 mm thick; few

root remains; abrupt smooth boundary to

67+ Wfm Ice wedge

Soil classification: Coarse-silty, mixed, gelic Glacic Aquiturbel

Explanation: The soil keys into the Glacic subgroup because of the presence of ice wedge. It keys into the Aquic great group due to the reduced matrix in Bg and Cf and the redoximorphic features (mottles) in these two horizons. The Turbic suborder is due to the strongly cryoturbated Bg/Oajj horizon. The extent of ice wedges under this landcover type is not known but I suppose that not the whole unit is under ice wedge. Thus for areas without ice wedges or ground ice, the soils should be classified as Typic Aquiturbels.

July 12, 1999 **Council 1, Open Woodland Plot**

Location: Lat. 64° 53' 59" N.; Long. 163° 40' 01" W.

Elevation:

Landform: Back slope of rolling hills

Microrelief: slightly convex and undulating

Slope: 8% east-facing

Drainage: well drained

Parent material: Residual, mica-rich schist

Sampled by: CL. Ping, Xiaoyan Dai, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-2   | Oi      | 7.5YR4/3 peat; least decomposed litter layer; 1-2 cm thick; abrupt smooth boundary to cm thick)                                      |
| 2-8   | Oa      | 2.5YR2.5/1 muck; highly decomposed organic matter; common very fine, fine and medium roots; 8-14 cm thick; abrupt smooth boundary to |
| 8-19  | Bhs     | 5YR3/2 fine sandy loam; weak medium subangular blocky structure; friable   |
|       |         | when moist, nonsticky and nonplastic when wet; common very fine, fine  |
|       |         | and few medium roots; some fine pebbles at contact with the horizon  |
|       |         | below; abrupt wavy boundary to   |
| 19-37 | BC1     | 2.5Y4/2 loam; 30% mottles 10YR4/6 in masses and root channels; weak  |

|       |     |  |
|-------|-----|--|
|       |     | medium platy structure; fraible when moist, slightly sticky and slightly               |
|       |     | plastic when wet; few very fine and fine roots; clear smooth boundary to               |
| 37-60 | BC2 | 2.5Y4/3 loam; weak fine lenticular structure with 20% fine ice lenses                  |
|       |     | (seasonal frozen); firm when frozen, slightly sticky and slightly plastic when         |
|       |     | wet; few fine roots; 5% gravel; clear smooth boundary to                               |
| 60-80 | BC3 | 2.5Y 4/3 loam with 10% muck of 5YR3/2 and 7.5YR3/3; moderate                           |
|       |     | medium lenticular structures with ice lenses 1-3 mm thick; firm when                   |
|       |     | frozen, slightly sticky and slightly plastic when wet; abrupt smooth boundary to       |
| 80+   | CR  | Fractured bedrock (mica schist) with cracks filled with seasonally frozen loamy soils. |

Soil classification: Fine-loamy, mixed, cryic Spodic Dystricryept (tentative)

Explanation: The soil is in the fine-loamy family because the mineral soil horizons lack coarse sand and fine gravel and having clay content >18% by field estimation. The mineralogy is mixed. The mean annual soil temperature at 50 cm is estimated <8°C thus it has a cryic soil temperature regime. The color of the Bhs horizon suggest it has eluvial accumulation of Fe-humus complexes thus it keys into the Spodic subgroup. It keys into the Dystricryept group because the base saturation is estimated <60%. Cryic means it is a cold Inceptisol.

Remarks:

The BC3 horizon has well developed cryogenic fabrics, i.e, lenticular structure. This suggest the past permafrost environment.

July 12, 1999 **Council 2, Forest Plot** (50 ft SW of Tower)

Location: Lat. 64° 54' 27" N.; Long. 163° 40' 24.5" W.

Elevation:

Landform: Back slope of rolling hills

Microrelief: slightly convex and undulating

Slope: 5% east-facing

Drainage: well drained

Parent material: Residual, mica-rich schist

Sampled and described by: CL. Ping, Xiaoyan Dai, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-11  | Oi      | 7.5YR4/3 peat; undecomposed litter layer; many very fine, fine medium and few coarse roots; abrupt smooth boundary to                      |
| 11-13 | Oe      | 5YR2.5/2 mucky peat; partially decomposed organic matter; many very fine, fine and few medium and coarse roots; abrupt smooth boundary to  |
| 13-31 | Oa      | 5YR2.5/1 muck; highly decomposed organic matter; common very fine, fine and few medium roots; abrupt smooth boundary to                    |
| 31-57 | Bhs     | 7.5YR3/3 very fine sandy loam; weak thin platy structure; friable when moist, nonsticky and nonplastic when wet; common very fine and fine |



roots; 10% of the horizon intrudes into the underlying horizon along crack

lines in wedge shape and this portion has strong lenticular structures;

abrupt wavy boundary to

57-90 2C 2.5Y5/3 sandy loam; moderate medium lenticular structure; friable when

moist, slightly sticky and slightly plastic when wet; few fine root remains;

10% gravel; clear smooth boundary to

90-110 2CR 2.5Y5/3 very gravelly sandy loam in cracks of fractured bed rock from

angular and channery mica schist.

Soil classification: Coarse-loamy, mixed, cryic Spodic Dystricryept

Explanation: See Council Plot 1.

Remarks: This soil shows evidence of past permafrost as indicated by the well developed cryogenic fabrics in 2C horizon.

July 12, 1999. **Council 3. Tundra site**

Location: Lat. 64° 50' 32.6" N.; Long. 163° 41' 39.2" W.

Elevation:

Landform: Flood plain

Microrelief: hummocky with thermokarst

Slope:

Drainage: Poor to very poor

Parent material: lacustrine

Sampled and described by: CL. Ping, Xiaoyan Dai, G.J. Michaelson, J.M. Kimble, L. Everett and A. Munule

Soil profile description:

| Depth  | Horizon | Description   |
|--------|---------|---|
| (cm)   |         |   |
| 0-22   | Oi      | 7.5YR3/3 peat; undecomposed moss and litters; many very fine, fine and medium roots; abrupt wavy boundary to  |
| 22-30  | Oe      | 2.5YR3/2 peaty muck; partially decomposed organic matter; many very fine, fine and common medium roots; abrupt wavy boundary to   |
| 30-52  | Oa      | 2.5YR3/2 muck; highly decomposed sedge residue; weak thin platy structure; few fine roots; abrupt smooth boundary to  |
| 52-68  | Bgf     | 2.5Y3/2 silty clay loam; weak, thin lenticular structure; frozen, ice lenses 1-2 mm thick; sticky and plastic when wet; reduced; common fine root remains, few live Eriophorum roots; abrupt smooth boundary to |
| 68-84  | Oabf    | 5YR3/2 buried muck layer from decomposed Sphagnum; frozen with fine segregated ice crystals; abrupt smooth boundary to  |
| 84-100 | Cf      | 2.5Y3/2 silty clay loam; ice-rich (ataxitic horizon), >65% ice by volume; sticky and plastic when wet; 5% cryoturbated organic matter.  |

Soil classification: Dysic Fluvaquentic Hemistel

Explanation: This is a frozen organic soil. The soil has a dysic family because it has acidic reaction (moist acidic tundra). The mixed texture of hemic between 0-52 cm keys it into the Hemistel great group. The layer of silty clay loam at 52-68 cm suggests its fluvial origin thus the

soil keys into the Fluvaquentic subgroup. Ice wedges may present in some areas judging from the occurrence of thermokarst. Thus soils with ice wedge are classified as Dysic Hemic Glacistels.

July 13, 1999. **Council 4. "Blueberry" shrub tundra site**

Location: Lat. 64° 53' 29" N.; Long. 163° 38' 57.6" W.

Elevation:

Landform: Hills, shoulder slope

Microrelief: hummocky with frostboils

Slope: 20% SE facing

Drainage: Imperfect

Parent material: Colluvium

Sampled and described by: CL. Ping, Xiaoyan Dai and G.J. Michaelson

Soil profile description:

| <u>Depth</u> | <u>Horizon</u> | <u>Description</u>  |
|--------------|----------------|---|
| (cm)         |                |   |
| 0-25         | Oi             | 10YR3/3 peat; undecomposed moss and litter; many very fine, fine and common medium roots; abrupt smooth boundary to ( 6-27 cm thick, with thicker part under Sphagnum moss and thinner part under sedge)          |
| 25-29        | Oa             | 5YR2.5/1 muck; highly decomposed organic matter; weak, fine granular structure; very fraible when moist, nonsticky and nonplastic when wet; many very fine, fine and common medium roots; abrupt wavy boundary to |

(3-7 cm thick)

- 29-33 A 2.5Y2.5/1 very gravely silty loam; weak, fine subangular structure; friable  
when moist, slightly sticky and slightly plastic when wet; 65%  
channers and  
flat slate fragment; many very fine, fine and few medium roots;  
abrupt  
irregular boundary to (0-4 cm thick)
- 33-50 Bg 5Y3/1 very gravely loam; saturated, slightly sticky and slightly plastic  
when wet; 15% Fe concentration 10YR4/4 around root channels;  
common  
fine and medium roots; 60% channers and flagstones; clear smooth  
boundary to (5-15 cm thick)
- 50-70 BCg 5Y3/1 very gravely loam; moderate medium subangular blocky structure;  
weak medium lenticular structure in pockets; friable when moist  
and  
slightly sticky and slightly plastic when wet; common fine roots;  
65%  
channers and flagstones; abrupt irregular boundary to (5-20 cm  
thick)
- 70-76 2Bwb 7.5YR3/4 fine sandy loam; buried horizon; moderate medium subangular  
and moderate medium platy structure; very friable when moist,  
nonsticky  
and nonplastic when wet; few fine and medium roots; common  
fine root  
channels; abrupt irregular boundary to (0-9 cm thick)
- 76-100 Bgb  
platy 5Y3/1 very gravely loam; buried horizon; moderate medium to coarse

structure breaking into moderate medium subangular structure;  
friable

when moist, slightly sticky and slightly plastic when wet; few fine  
medium

roots, common root channels; >60% channers and flagstones,  
mostly slate.

Soil classification: Loamy-skeletal, mixed, cryic Histic Cryaquept

Explanation: The soil has a loamy-skeletal family due to its >35% rock fragment content. It has a mixed mineralogy. It keys into the Inceptisol order and Aquic suborder because of the reduced matrix and redoximorphic features in the Bg horizon caused by episaturation. The mean annual soil temperature at 50 cm is estimated <8°C but without permafrost, thus it has a cryic soil temperature regime and the soil keys into Cryaquept great group. The Histic subgroup reflects the moderate thick (15-40 cm) organic horizon. This soils is polygenic because it shows evidence of frostboils and solifluction; the current surface is the result of frostboil and the buried horizons are due to solifluction.

July 13, 1999. **Council 5. Shrub site**

Location: Lat. 64° 56' 09" N.; Long. 163° 44' 14.6" W.

Elevation:

Landform: Hills, backslope, convex

Microrelief: plane

Slope:

Drainage: well-drained

Parent material: Residuum

Sampled and described by: CL. Ping, Xiaoyan Dai and G.J. Michaelson

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-5   | Oi      | 7.5YR3/3; peat; slightly decomposed litter; many very fine, fine, common medium and few coarse roots; abrupt smooth boundary to  |
| 5-11  | Oa      | 10YR2/1 muck; highly decomposed organic matter; weak fine granular structure; friable when moist, nonsticky and nonplastic when wet; many very fine, fine and common medium roots; abrupt smooth boundary to                         |
| 11-30 | Bw      | 2.5Y4/2 loam; 20% mottles 10YR3/6 in masses; moderate thin lenticular structure; friable when moist, slightly sticky and slightly plastic when wet; common very fine, fine and few medium roots; 8% channers; clear wavy boundary to |
| 30-50 | BC      | 5Y3/2 loam; moderate thin platy structure breaking into moderate fine structure; friable when moist, slightly sticky and slightly plastic when wet; few fine roots; 10% cobbles; clear smooth boundary to                            |
| 50+   | CR      | 2.5Y4/2 very channery sandy loam; soil filled in channer cracks; slightly sticky and slightly plastic when wet; 65% channers and most rock fragments has silt caps; few ice crystals in rock cracks due to seasonal frost.           |

Soil classification: Loamy, mixed, cryic Typic Dystrocryept

Explanation: The soils has a loamy texture between 25 cm from the mineral surface to 100 cm or to the CR horizon. It also has a cryic soil temperature regime thus it keys into the Cryept suborder. The base saturation in the mineral horizon is estimated less than 60% thus it keys into the Dystrocryept great group. It is in the Typic subgroup because there is no other special features.

**September, 1999.** C.L. Ping and G.J. Michaelson sampled soils from CALM sites in Prudhue Bay (M.P. 411) and Galbraith Lake, and the ATLAS/ITEX site by the Toolik Lake Snow Fence Plot (acidic tundra). Ron Paetzold downloaded monitoring data from dataloggers at these sites.

September 14, 1999. **Toolik Lake, Snow Fence site** - Moist acidic tundra

Location: Lat. 68° 37' 00" N.; Long. 149° 35' 00" W.

Elevation:

Landform: Foothills, convex

Microrelief: hummocky

Slope: 10% east

Drainage: poorly-drained

Parent material: glacial till

Sampled and described by: CL. Ping and G.J. Michaelson

Soil profile description:

| Depth | Horizon | Description  |
|-------|---------|--|
| (cm)  |         |  |
| 0-5   | Oi      | 2.5YR4/3 peat; many medium and common fine roots; abrupt irregular boundary to |

- 5-25 Oe 7/5YR3/3 mucky peat; many very fine, fine and common medium roots;  
abrupt irregular boundary to
- 25-37 Oa 7.5YR3/2 muck; many very fine, fine and few medium roots; abrupt wavy  
boundary to
- 37-50 Bg1 2.5Y5/2 loam, matrix with 30% 10YR4/6 root linings; moderate medium  
subangular structure; friable when moist and slightly sticky and  
slightly  
plastic when wet; many very fine and fine roots; abrupt irregular  
boundary  
to
- 50-65 Bg/Oajj 10YR3/3 mucky silty loam; saturated, slightly sticky and slightly plastic  
when wet; common fine roots; clear smooth boundary to
- 65-75 Bg2 2.5Y4/2 and 5Y4/1 silty loam; saturated and reduced, slightly sticky and  
slightly plastic when wet; abrupt smooth boundary to
- 75-87 Cf 10YR3/2 loam; frozen, slightly sticky and slightly plastic when wet; ice  
rich  
upper permafrost.

Soil classification: Fine-loamy, mixed, gelic Ruptic-Histic Aquiturbel

September 15, 1999. **Prudhoe Bay, MP 411, wet nonacidic tundra** (Romanovski's site)

Location: Lat. 69° 00' 00" N.; Long. 149° 00' 00" W.

Elevation:



Landform: Arctic coastal plain

Microrelief: frostboils and low hummocks

Slope: 1% north

Drainage: very poorly-drained

Parent material: alluvium

Sampled and described by: CL. Ping and G.J. Michaelson

Soil profile description:

| <u>Depth</u> | <u>Horizon</u> | <u>Description</u>  |
|--------------|----------------|---|
| (cm)         |                |   |
| 0-5          | Oi             | 7.5YR3/4 peat; many fine and few medium roots; marl deposit on surface;<br>abrupt wavy boundary to                                |
| 5-18         | Oa/Oe          | 10YR3/3 muck; many very fine, fine and few medium roots; abrupt wavy<br>boundary to   |
| 18-35        | Bg1            | 5Y4/1 silty loam; saturated, slightly sticky and slightly plastic when wet;<br>many very fine roots; abrupt irregular boundary to |
| 35-45        | Oajj<br>fine   | 10YR3/2 mucky silty loam; pockets in Bg horizon; saturated; common<br>roots; abrupt irregular boundary to                         |
| 45-80        | Bg2            | 5Y3.5/1.5 silty loam; saturated, slightly sticky and slightly plastic when<br>wet; common fine roots; abrupt smooth boundary to   |
| 80+          | Cf             | Upper permafrost; silty loam; ice content >60%.   |

Soil classification: Fine-silty, mixed, gelic, calcareous Ruptic-Histic Aquiturbel

September 17, 1999. **Galbraith Lake, moist nonacidic tundra** (Romanovski's site)

Location: Lat. 68° 28' 37" N.; Long. 149° 30' 12" W.

Elevation:

Landform: fan

Microrelief: frostboils and low hummocks

Slope: 0%

Drainage: poorly-drained

Parent material: alluvium

Sampled and described by: CL. Ping and G.J. Michaelson

Soil profile description:

| <u>Depth</u> | <u>Horizon</u> | <u>Description</u>  |
|--------------|----------------|---|
| (cm)         |                |   |
| 0-10         | Oi             | 7.5YR3/1 peat; many very fine, fine and few medium roots; clear smooth boundary to  |
| 10-28        | Oe/Oa          | 7.5YR2.5/2 peaty muck; many very fine and fine roots; abrupt smooth boundary to   |
| 28-49        | Bg             | 2.5Y4/1 silty loam; weak coarse angular blocky structure breaking into weak medium lenticular structure; friable when moist, slightly sticky and plastic when wet; common fine roots; abrupt wavy boundary to |
| 49-58        | Oejj/Bg        | 10YR2/2 peaty muck (60%) and 2.5Y4/1 silty loam; saturated, slightly sticky and slightly plastic; abrupt smooth boundary to   |

58-73 Cf/Oejf 2.5Y4/1 silty loam (70%) and 10YR2/2 peaty muck; slightly sticky and slightly plastic.

Soil classification: Fine-silty, mixed, gelic, nonacidic Ruptic-Histic Aquiturbel